

Northern States Power Company d/b/a Xcel Energy

EQB Docket No. 05-91-PPS-Xcel High Bridge

**IN THE MATTER OF APPLICATION TO THE MINNESOTA ENVIRONMENTAL
QUALITY BOARD FOR A GENERATING PLANT SITE PERMIT FOR THE
HIGH BRIDGE COMBINED CYCLE PROJECT**

Direct Testimony

of

John T. Lee, P.E.

(Barr Engineering Co.)

**BEFORE THE ENVIRONMENTAL QUALITY BOARD
OF THE STATE OF MINNESOTA
DIRECT TESTIMONY OF JOHN T. LEE**

Q. Please state your name and business address.

A. John T. Lee, 4700 West 77th Street, Minneapolis, MN 55435.

Q: Briefly describe your professional experience.

A: I graduated from Iowa State University in 1979 with a Bachelor of Science degree in Civil Engineering. I have been working as an engineering and project management professional for over 25 years as a consultant to the power industry and other public and private clients. I have held various engineering and management positions at Barr Engineering Co., where I started working in 1979.

During my 25 years at Barr, I worked on a wide variety of environmental engineering projects for dozens of clients throughout the Midwest. I have completed projects for several utility and independent power producer clients including Xcel Energy, Great River Energy, Minnesota Power, Otter Tail Power Company, Montana Dakota Utilities, WE Energies, MidAmerican Energy, Alliant Energy, Wisconsin Public Service, Consumers Energy, Upper Peninsula Power Company, Tenaska Inc., and NRG Energy. My assignments have taken me to several states including Minnesota, Missouri, Iowa, Michigan and Wisconsin where I am a registered Professional Engineer. I have worked on all aspects of projects from site investigations through design and project management.

In 1999, I took on the responsibilities of for preparing the Site Permit Application for Xcel Energy's \$156 million Black Dog Generating Plant Repowering Project, which was completed in 2002. Prior to that, in 1998, I had a similar role on NRG Energy and Tenaska Inc.'s Lakefield Junction Peaking Plant Project located in southern Minnesota. In 2003 and 2004, I again worked for Xcel Energy to obtain Site Permits for the Angus Anson (South Dakota) and the Blue Lake (Minnesota) combustion turbine projects. I am also currently working with Great River Energy

1 on a peaking plant project where I prepared a Minnesota Site Permit Application
2 that was submitted in March 2005.

3 **Q. On whose behalf are you submitting this testimony?**

4 A. On behalf of the applicant, Northern States Power Company d/b/a Xcel Energy.
5

6 **Q: What is the purpose of your testimony?**

7 A: My testimony is intended to support Xcel Energy's application to the Minnesota
8 Environmental Quality Board ("MEQB") captioned: Application to the Minnesota
9 Environmental Quality Board for a Generating Plant Site Permit ("Site
10 Application"), EQB Docket No. 05-91-PPS-Xcel High Bridge ("Application").

11 **Q: Were you involved in the preparation of Xcel Energy's application?**

12 A: Yes. I coordinated and was responsible for the preparation and submission of the
13 Application.

14 **Q: Are you available to act as sponsor for particular sections of the**
15 **Application?**

16 A: Yes. I am sponsoring Chapter 1 (Introduction) and Chapter 4 (Environmental
17 Information)

18 **Q: Do you have any changes or corrections to make in these chapters of the**
19 **application?**

20 A. Yes. Xcel Energy's design and procurement processes have progressed since the
21 Application was filed, resulting in a few small changes to some of the parameters
22 in the environmental information. We now expect that the most likely combustion
23 turbine manufacturer that will provide the turbines for the Project will be
24 Mitsubishi. The Application technical information was generally based on the
25 assumption that General Electric combustion turbines would be used on the
26 Project. While the two turbine brands perform similarly, there are differences,
27 particularly with regard to air emissions.
28

1 **Q: What are the changes or corrections you would like to make in these**
2 **chapters of the application?**

3 The changes and corrections I would like to make are listed below:

4

Location	Change or Correction
5 Application Section 1.3, 6 page 1-2	Replace the first bullet item with the following: Provide environmental improvement at a major metropolitan power plant through significant reductions in SO _x and NO _x emissions and <i>virtually</i> eliminating lead and mercury emissions;
8 Application Section 4.1.5, page 9 4-4 and 4-5 10 (also affects Section 5.1, pages 11 30-32 of the EA)	Replace the entire Section 4.1.5 with the revised Section 4.1.5 included in Exhibit XE1 to this testimony. These changes reflect the change in the assumed turbine manufacturer and Xcel Energy's decision not to pursue Clean Unit Designation for the combustion turbines.
12 Application Section 4.6.5, page 13 4-17, 3 rd ¶ 14 (also affects Section 4.3, page 15 25, 3 th ¶ of the EA)	Replace the entire paragraph with the following: There are no jurisdictional wetlands on the Project site. A wetland is identified in the National Wetland Inventory at the northern edge of the plant site in an area that was previously a storm water storage pond. (see Figure 4-8). This storm water storage pond no longer exists, apparently having been filled during the construction of new Shepard Road or other grading activities. The Plant's storm water storage pond in the southwest corner of the property is a pond constructed specifically to manage storm water runoff from the plant site. The pond is expected remain in use in its current capacity.
17 Application Section 4.1, Tables 18 4-1, 4-2 and 4-2a 19 (also affects Tables 11, 12, and 20 13 of the EA)	Replace those Tables with the revised tables attached and labeled Exhibit XE1.

21 **Q: Do any of these corrections materially change any of the analysis or**
22 **conclusions contained in the Application?**

23 A. No.

24 **Q: Do you have any comments to make on the Environmental Assessment for**
25 **this Project prepared by the Minnesota Environmental Quality Board?**

26 A. Yes.

1 **Q: What are the comments you would like to make to make on the**
2 **Environmental Assessment?**

3 **A.** The comments I would like to make are listed below:

Location	Comment
Page 3, 5 th ¶	Suggest clarifying the last sentence by adding to the end: "as permitted under the plant's NPDES permit."
Page 5, 1 st ¶	Add the following phrase to the end of the first sentence: ", or, as a back-up, from the city."
Page 6, 2 nd ¶	Discussion of 316(b) requirements may be slightly misleading. Staying below 5% mean annual river flow is not required by rule, but doing so exempts Xcel Energy from some other requirements that would otherwise have to be met.
Page 6, 2 nd ¶	The last sentence is incorrect. Five percent of mean annual flow is the trigger point at which the facility becomes subject to the entrainment performance standard in addition to the impingement performance standard. At less than five percent mean annual river flow, High Bridge is only subject to the impingement performance standard.
Page 6, 3 rd ¶	Discussion of 316(b) requirements may be misleading. Staying below 0.5 fps intake velocity is not required by rule, but exempts Xcel Energy from other requirements that would otherwise have to be met.
Page 6, 3 rd ¶	In the last sentence, with deflector/curtain design yet to be established, this sentence may be more appropriately worded: "Precautions will be taken to identify structures potentially affected by river traffic, as necessary." Furthermore, given other maintenance approaches and existing screen considerations, the last paragraph is more appropriately phrased: "The new wedge wire screens will be maintained via combinations of the following technologies and operations: air burst back flow system, high pressure wash, de-icing lines, silt sluicing lines, and for zebra mussel control, mechanical cleaning, chemical treatment and/or coatings/metallurgy. Existing trashracks and traveling screens will be left in place behind the new screens as practical and will provide a back-up means for screening if the new screens are removed for maintenance or servicing."
Page 9, Section 2.2	Replace the first bullet item with the following: Provide environmental improvement at a major metropolitan power plant through significant reductions in SO _x and NO _x emissions and <i>virtually</i> eliminating lead and mercury emissions;

Page 25, 3 rd ¶	Replace the entire paragraph with the following: There are no jurisdictional wetlands on the Project site. A wetland is identified in the National Wetland Inventory at the northern edge of the plant site in an area that was previously a storm water storage pond. (see Figure 11). This storm water storage pond no longer exists, apparently having been filled during the construction of new Shepard Road or other grading activities. The Plant's storm water storage pond in the southwest corner of the property is a pond constructed specifically to manage stormwater runoff from the plant site. The pond is expected remain in use in its current capacity.
Page 38, Second grouping of bullets	The erosion/sediment control practices listed should be characterized as examples of one or more measures or combination of measures to be implemented rather than the implied listing of all measures to be implemented.
Table 7	There are a several items that will not apply to the Project, including Risk Management Plan, AST permit (>1M gallon), Individual Septic system.
Tables 11, 12 and 13	Replace those Tables with the revised Tables in Exhibit XE1. These changes are a result of changes in operational characteristics of Mitsubishi turbine, currently assumed for the Project. At the time of filing the original Application use of General Electric turbines was assumed.
Appendix A	Letter discussing project: Under heading "Matters to Be Addressed" the letter incorrectly references the "Cannon Falls Energy Center Plant" what's this?

Q: In your opinion, does the Application demonstrate that the proposed Project is consistent with the State's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure and adequately addresses the considerations listed in Minnesota Statutes § 116C.57, Subd. 4 that should guide the Environmental Quality Board in its evaluation and designation of a power plant site?

A: Yes, it does. The application positively addresses the twelve considerations found in Minnesota Statutes § 116C.57, Subd. 4 that guide the Board in its evaluation and designation of power plant sites. The locations in the Application that address each of the considerations is listed below.

Statutory Consideration	Application Section
<p><i>(1) Evaluation of research and investigations relating to the effects on land, water and air resources of large electric power generating plants and high voltage transmission lines and the effects of water and air discharges and electric and magnetic fields resulting from such facilities on public health and welfare, vegetation, animals, materials and aesthetic values, including baseline studies, predictive modeling, and evaluation of new or improved methods for minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment;</i></p>	Section 4
<p><i>(2) Environmental evaluation of sites and routes proposed for future development and expansion and their relationship to the land, water, air and human resources of the state;</i></p>	Section 4
<p><i>(3) Evaluation of the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects;</i></p>	Sections 3 and 4
<p><i>(4) Evaluation of the potential for beneficial uses of waste energy from proposed large electric power generating plants;</i></p>	Section 3
<p><i>(5) Analysis of the direct and indirect economic impact of proposed sites and routes including, but not limited to, productive agricultural land lost or impaired;</i></p>	Section 4.4 and 4.5
<p><i>(6) Evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site and route be accepted;</i></p>	Section 4
<p><i>(7) Evaluation of alternatives to the applicant's proposed site or route proposed pursuant to subdivisions 1 and 2;</i></p>	Not applicable to Alternative Process under Minn. Rules 4400.2000 through 4400.2950
<p><i>(8) Evaluation of potential routes that would use or parallel existing railroad and highway rights-of-way;</i></p>	Not applicable to power plant siting

(9) Evaluation of governmental survey lines and other natural division lines of agricultural land so as to minimize interference with agricultural operations;	Not applicable, Project does not affect agricultural lands.
(10) Evaluation of the future needs for additional high voltage transmission lines in the same general area as any proposed route, and the advisability of ordering the construction of structures capable of expansion in transmission capacity through multiple circuiting or design modifications;	Not applicable to power plant siting
(11) Evaluation of irreversible and irretrievable commitments of resources should the proposed site or route be approved; and	Addressed throughout Application
(12) When appropriate, consideration of problems raised by other state and federal agencies and local entities.	Section 1.6 and throughout Application

The High Bridge Combined Cycle Power Plant is part of Xcel Energy's Metropolitan Emission Reductions Program that has been approved by the Public Utilities Commission. The Commission and the Pollution Control Agency concluded that the project would result in significant, important improvements to air quality in the metropolitan area. In this circumstance the Company is replacing the existing High Bridge Power plant, which is fueled with coal, with a new natural gas fueled plant on the same site. No new commitments of land or other resources will be required since the new plant will be placed within the coal yard of the existing plant. In fact the overall footprint of the plant will be significantly reduced upon conversion of the coal yard and demolition of existing plant structures. Air emissions will be substantially reduced. Water use and discharges from the new plant will be within existing permit limits and in fact, as the result of the change, intake improvements will be made. No new transmission right of way is required for the project.

The consideration of any alternative site would forego all the benefits associated with replacing the High Bridge Plant with a combined cycle plant and could necessitate transmission additions to maintain reliable operation of the electrical system.

Combined cycle technology increases the efficiency of fuel utilization. Waste heat from combustion turbines is utilized to produce steam, which is utilized in steam turbine generators. Plant efficiency approaches 50 % compared to just over 30 % in a coal plant.

Q: In your opinion, does the Application adequately address the factors listed in Minnesota Rules 4400.3150 that the Environmental Quality Board should consider in determining whether to issue a permit for a large electric power generating plant?

A: Yes, it does. The locations in the Application that address each of the considerations is listed below.

Regulatory Consideration	Application Section
A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;	4.3, 4.4, 4.5
B. effects on public health and safety;	4.5.1
C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;	4.4.3
D. effects on archaeological and historic resources;	4.5.3
E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;	4.1, 4.2, 4.6
F. effects on rare and unique natural resources;	4.6.6
G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;	Section 3, Section 4, 2.3
H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;	Not applicable to power plant sites
I. use of existing large electric power generating plant sites;	Addressed throughout Application
J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;	2.1, 2.6.2, 3.1.5
K. electrical system reliability;	Section 1, Section 2, Section 3
L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;	2.2, 3.3, 3.4
M. adverse human and natural environmental effects	Section 4

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

which cannot be avoided; and	
N. irreversible and irretrievable commitments of resources.	Addressed throughout Application

The replacement of the High Bridge plant with a new, state of the art, natural gas fueled, combined cycle plant will reduce the impacts of electricity production in the metropolitan area. Less land area will be committed to plant facilities, no land use conversions will be required, no natural resource impacts will result, air emissions will be drastically reduced, water intake from the river will be improved, and aesthetically, the plant will be much less prominent in the St. Paul and Mississippi River landscape. By utilizing the existing High Bridge site the Company can achieve all of these environmental benefits while maintaining the reliability of the electrical system without the need for additional transmission lines.

Q: Does this conclude your direct testimony?

A: Yes.

EXHIBIT XE1

**DIRECT TESTIMONY
of John T. Lee, P.E.**

**In The Matter Of Application To The Minnesota Environmental Quality Board For
A Generating Plant Site Permit for the High Bridge Combined Cycle Project , EQB
Docket No. 05-91-PPS-Xcel High Bridge**

Quality Tables

EXHIBIT XE1

DIRECT TESTIMONY OF JOHN T. LEE, P.E. (BARR ENGINEERING CO.)

In The Matter Of Application To The Minnesota Environmental Quality Board For A Generating Plant Site Permit for the High Bridge Combined Cycle Project, EQB Docket No. 05-91-PPS-Xcel High Bridge

Table 4-1 Projected Actual Air Emissions

Pollutant	CT Emissions Normal Operation		CT1 Emissions Startup/Shutdown		CT2 Emissions Startup/Shutdown		Auxiliary Boiler		Fire Pump Diesel		Project Totals	
	Avg. (lbs/hr) ^a	(tons/yr) ^b	Avg. (lbs/hr) ^a	(tons/yr) ^{c,d}	Avg. (lbs/hr) ^a	(tons/yr) ^{c,d}	(lbs/hr)	(tons/yr)	(lbs/hr)	(tons/yr) ^e	(lbs/hr)	(tons/yr)
SO ₂	3.3	8.6	1.6	0.65	1.6	0.53	0.08	0.33	0.62	0.09	7.2	10.2
NO _x	44.6	116.5	44.7	18.1	42.5	14.0	5.3	23.1	9.3	1.4	146.4	173.8
PM ₁₀	12.2	32.2	5.8	2.3	5.8	1.9	0.88	3.9	0.66	0.10	25.4	40.4
CO	89.3	234.7	1,203.5	487.6	645.1	212.2	7.0	30.8	2.0	0.30	1,946.9	965.6
VOCs	14.8	38.8	79.7	32.3	64.3	21.1	0.44	1.9	0.74	0.11	159.9	94.3

^a An average hourly emission rate was derived based on the projected annual emission rate divided by the projected hours of operation in the specified operating mode.

^b The upper bound projected annual emissions are based on the following assumptions: 1) two Mitsubishi M501F combustion turbines operating at full load at the average ambient temperature; 2) an annualized capacity factor of 60% for the facility, which is equivalent to 5,256 hours of full load operation; and 3) the duct burners operate during 10% of the combined cycle hours of operation.

^c Startup and shutdown (SUSD) emission estimates are based on the assumptions that there are 4 hot starts per week, 1 cold start per week, and 52 weeks of operation per year.

^d No increase in SO₂ and PM₁₀ emissions are assumed to occur during SUSD operation. SUSD emission were calculated assuming the same emission factors as for normal operations.

^e The fire pump engine operates no more than 300 hours per year.

Table 4-2 Future to Present Annual Emissions Comparison

Pollutant	Future Projected Emissions (tons/yr)	Past Actual Emissions (tons/yr)	Projected Emissions Change (tons/yr)
SO ₂	10.2	3,892.9	-3,882.7
NO _x	173.2	5,779.2	-5,606.0
PM ₁₀	40.4	476.8	-436.4
CO	965.6	257.2	708.4
VOCs	94.3	30.6	63.7

EXHIBIT XE1

**DIRECT TESTIMONY OF JOHN T. LEE, P.E. (BARR ENGINEERING CO.)
In The Matter Of Application To The Minnesota Environmental Quality Board For A
Generating Plant Site Permit for the High Bridge Combined Cycle Project , EQB Docket No.
05-91-PPS-Xcel High Bridge**

4.1.5 Air Pollutant Impacts

As part of the PSD permit application, air-dispersion modeling was performed to demonstrate that the emissions from the facility will not cause or contribute to a violation of an ambient air quality standard or PSD increment. Modeling was performed using a modeling protocol that conforms to U.S. Environmental Protection Agency (EPA) standards to predict the maximum ambient concentrations of CO.

NAAQS Modeling

Xcel Energy sources were modeled to determine compliance with the National and Minnesota Ambient Air Quality Standards (NAAQS and MAAQS). MPCA guidance was relied upon to determine the appropriate background concentrations CO.

A complete modeling report was submitted as part of the PSD permit application. The PSD permit application will be reviewed by the MPCA and will be placed on public notice in accordance with the requirements of the application process.

Modeling Results

The modeling results summarized in Table 4-2a demonstrate the ambient air concentrations of CO resulting from emissions from the proposed generation Plant, together with emissions from other regional emission sources, comply with the corresponding standards.

Table 4-2a Predicted Ambient Air Concentrations

Pollutant	Standard Averaging Period	Modeled Concentrations (micrograms per cubic meter)	Background Concentration (micrograms per cubic meter)	Total Concentration (micrograms per cubic meter)	Standard (micrograms per cubic meter)
CO	NAAQS 1-hr	7,758.4	7,117	14,875.4	40,000
CO	NAAQS 8-hr	2,756.8	4,344	7,090.8	10,000